स्वामी रामानंद तीर्थ
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SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

Synopsis of the Proposed Research Plan

Entitled

"PHARMACOGNOSTIC AND ACTIVITY GUIDED SCREENING OF SOME MYRTACEAE PLANTS AGAINST DIABETES AND CANCER."

SUBMITTED BY

MR. MORE R. N.

(RESEARCH SCHOLAR)

BOTANY RESEARCH LABORATORY AND PLANT DISEASE CLINIC

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DR. D. M. JADHAV
(RESEARCH GUIDE)
POST GRADUATE DEPARTMENT OF BOTANY
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"PHARMACOGNOSTIC AND ACTIVITY GUIDED SCREENING OF SOME MYRTACEAE PLANTS AGAINST DIABETES AND CANCER."

Introduction

Plants have been used for medicinal purposes long before prehistoric period. Ancient Unani manuscripts, Egyptian papyrus and Chinese writings described the use of herbs. Traditional systems of medicine continue to be widely practiced on many accounts. Population rise, inadequate supply of drugs, prohibitive cost of treatments, side effects of several synthetic drugs and development of resistance to currently used drugs for infectious diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments.

Among ancient civilizations, India has been known to be rich repository of medicinal plants. The forest in India is the principal repository of large number of medicinal and aromatic plants, which are largely collected as raw materials for manufacture of drugs and perfumery products. About 8,000 herbal remedies have been codified in AYUSH systems in India. Ayurveda, Unani, Siddha and Folk (tribal) medicines are the major systems of indigenous medicines. Among these systems, Ayurveda and Unani Medicine are most developed and widely practice in India.

Treatment with medicinal plants is considered very safe as there is no or minimal side effects. These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes. Medicinal plants are considered as a rich resources of ingredients which can be used in drug development either pharmacopoeial, non-pharmacopoeial or synthetic drugs. A part from that, these plants play a critical role in the development of human cultures around the whole world. Moreover, some plants are considered as important source of nutrition and as a result of that they are recommended for their therapeutic values.

The term pharmacognosy is derived from two Greek words 'Pharmacon' meaning drug or medicine and 'gnosis' meaning knowledge. This term was first coined by C.A. Seydler in his dissertation entitled 'Analectapharmacognosia' in 1895. Herbal medicines as the major remedy in traditional medical system have been used in medical practice for thousands of years and have made a great contribution to maintain human health (Kunwar et.al 2009).

According to WHO pharmacognosy is a chapter of standardization and quality control of herbal drugs, standardization involves the physicochemical evaluation of crude drug covering aspects such as selection and handling of crude material. Most of the attention is normally paid to quality indices including macro and microscopic examination, ash values, moisture content, extractive values, crude fiber, qualitative and quantitative chemical evaluation and chromatographic examination.(Fiaz Alam and Qazi Najam Us Saqib 2011).

Myrtaceae family compresses about 140 genera and 3,400 species distributed mainly subtropical and tropical regions of the world. Myrtaceae family is particularly abundant in Australia where some *Eucalyptus* trees are world's tallest angiosperms. Myrtaceae is represented in India by about 15 genera and over 170 species. Beautiful pinkish flowers of *Myrtus communis* are considered highly sacred among Greeks, Egyptians, Jews, and Persian, and used in religious rites and ceremonies. Some of the larger genera of Myrtaceae along with their number of reported species include *Eugenia* (1000), *Eucalyptus* (500), *Syzygium* (500), *Myrcia* (500), *Psidium* (140), *Myrtus* (100) and *Melaleuca* (100)most of the Indian myrtaceous plants shows potential medicinal property (Sharma, 2004).

Review of Literature

The nature has provided a complete storehouse of remedies to cure ailments of mankind. About 80 per cent of the world's population depends partially or wholly on traditional medicine for its primary health care needs. Herbal medicines as the major remedy in traditional medical system have been used in medical practice for thousands of years and have made a great contribution to maintain human health. The global interest in study and practice of crude drugs has therefore, considerably increased during the last two decades because of growing awareness about the toxicity and side effects of synthetic drugs, their limitations in many areas of therapy, comparatively high cost and often drug beyond the reach of common man.

Kumar et.al (2011) made pharmacognostic study and anti-inflammatory activity of *Callistemon lanceolatus* leaf (Family: Myrataceae) commonly known as bottle brush, is frequently cultivated throughout India in gardens as ornamental plant. Aqueous extracts of the leaves and flowers have antifungal and antibacterial activity. The plant extracts inhibited urd bean leaf crinkle virus *in vitro* studies.

Marcia et.al (2015) reviewed pharmacological Activities of Myrcia (Myrtaceae). The non-volatile compounds isolated from Myrcia are usually flavonoids, tannins, acetophenone derivatives and triterpenes. Anti-inflammatory, antinociceptive, antioxidant, antimicrobial activities have been described to Myrcia essential oils, while hypoglycemic, anti-hemorrhagic and antioxidant activities were attributed to the extracts. Flavonoid glucosides and acetophenone derivatives showed aldose reductase and α-glucosidase inhibition, and could explain the traditional use of Myrcia species to treat diabetes.

Herbal medicinal products have been documented as a significant source for discovering new pharmaceutical molecules that have been used to treat serious diseases. Many plant species have been reported to have pharmacological activities attributable to their phytoconstituents such are glycosides, saponins, flavonoids, steroids, tannins, alkaloids, terpenes, etc. *Syzygium aromaticum* (clove) is a traditional spice that has been used for food preservation and possesses various pharmacological activities. *S. aromaticum* is rich in many phytochemicals such as sesquiterpenes, monoterpenes, hydrocarbon, and phenolic compounds. Eugenyl acetate, eugenol, and β-caryophyllene are the most significant phytochemicals in clove oil. Pharmacologically, *S. aromaticum* has been examined toward various pathogenic parasites and microorganisms, including pathogenic bacteria, *Plasmodium*, *Babesia*, *Theileria* parasites, *Herpes simplex*, and hepatitis C viruses. Several reports documented the analgesic, antioxidant, anticancer, antiseptic, anti-depressant, antispasmodic, anti-inflammatory, antiviral, antifungal, and antibacterial activity.

Shanthi et.al (2014) studied *Eugenia jambolana* plant of family myrtaceae Pharmacognostical and Preliminary Phytochemical Studies on Stem Bark of *Eugenia jambolana.* Accordingly, the anatomy of *Eugenia jambolana* shows the presence of compactly arranged cork cells, tannin cells, sclereids, fibers and calcium oxalate crystals.

Psidium guajava Linn. (Guava) is used not only as food but also as folk medicine in subtropical areas around the world because of its pharmacologic activities. In particular, the leaf extract of guava has traditionally been used for the treatment of diabetes in East Asia and other countries. Many pharmacological studies

have demonstrated the ability of this plant to exhibit antioxidant, hepatoprotective, anti-allergy, antimicrobial, antigenotoxic, antiplasmodial, cytotoxic, antispasmodic, cardioactive, anticough, antidiabetic, anti-inflamatory and antinociceptive activities, supporting its traditional uses (Neeta Chaudhary and Shalini Tripathi 2013).

Objectives of research:

The present research work is aimed with following objectives.

1. Pharmacognostic study of selected Myrtaceae Plants
2. Ethnobotanical survey of Medicinally important plants of Myrtaceae
3. Phytochemical analysis of some selected plants of Myrtaceae
4. HPTLC analysis of selected plants.
5. Determination of antimicrobial potential of selected plant extracts.
6. Determination of antioxidant activity of some selected plants.
7. Determination of activity guided anti-diabetic and anticancer activity of some selected plants.

Methodology to be adopted

The current research work will be completed using standard and established protocols.

Phase I: Literature Survey, collection and identification of Plant Materials:-

In the first phase of research work extensive literature survey will be done in order to know latest scenario of research in undertaken and allied area. The ethno botanical survey and collection of plant material will be done by giving personal visit to field and also by interacting with some local tribal healers. The collected plant materials will be identified by using standard floras (Cooke 1967; Naik 1998). pharmacognonstic study of selected plant will be done.

Phase II: Plant Extraction and phytochemical analysis:-

Plant samples will be collected from the fields. And extracted for phyto-chemical analysis by standard using prescribed methods. (Harborne,1973; Sadasivam & Manikam, 2005; Thimmaiah, 1999, Evans 1997).

Phase III: Antimicrobial Studies: -

By using standard protocols, in third phase the antimicrobial activity of plant extracts of Myrtaceae will be tested against different fungi and bacteria.

Phase IV: HPTLC Analysis: -

In this phase emphasis will be given on HPTLC analysis of selected plant extract in central instrumentation facility available at Science College Nanded using standard protocols (Sethi 1996; Mona et.al. 2012).

Phase V: Antioxidant, Anti-diabetic and Anticancerous activity: -.

In this phase the focus will be given on Antioxidant, Anti-diabetic and Anticancerous activity using standard protocols recommended by, Gulnazet.et.al (2014); Abdullah and Kashim, (2017); Anticancerous activity will be carried out employing out sourcing facility available at specific scientific research labs (Rubinstein and Boy 1990).

Phase-VI: Thesis writing and Submission: -

Scientific writing of thesis will be done for final submission to University.

Importance of study/ society application

International status

Gaber El-Saber Batiha (2020), worked on Herbal medicinal products have been documented as a significant source for discovering new pharmaceutical molecules that have been used to treat serious diseases. Many plant species have been reported to have pharmacological activities attributable to their phyto-constituents such are glycosides, saponins, flavonoids, steroids, tannins, alkaloids, terpenes, etc. *Syzygium aromaticum* (clove) is a traditional spice that has been used for food preservation and possesses various pharmacological activities.

Azlini et.al (2016), done study on *Syzygium polyanthum* (Wight) Walp is one of the ethnomedicinal plants that is currently gaining attention for its various pharmacological potentials. They reviewed its traditional uses, chemical profiles, toxicological aspects, nutritional values, as well as its pharmacological properties. In this literature search in Science Direct, Scopus, and Google Scholar databases, it was found that *S. polyanthum* has valuable therapeutic potentials including anti-diabetic,

antihypertensive, antimicrobial, antioxidant, anticancer, antitumor, anti-diarrheal, acetylcholine esterase inhibitory, and dental plaque inhibition properties. However, few research areas, especially its toxicological profiles, mechanism of actions, as well as identification of its bioactive compound, require more in-depth studies.

Sumra Naseer, and Shabbir Hussain (2018), made study on *Psidium guajava* (guava) in Pakistan. This plant finds applications for the treatment of diarrhea, dysentery, gastroenteritis, hypertension, diabetes, caries and pain relief and for improvement in locomotors coordination. Its leaf's extract is being used as a medicine in cough, diarrhea, and oral ulcers and in some swollen gums wound. Its fruit is rich in vitamins A, C, iron, phosphorus and calcium and minerals. It contains high content of organic and inorganic compounds like secondary metabolites e.g. antioxidants, polyphenols, antiviral compounds, anti-inflammatory compounds. The phenolic compounds in guava help to cure cancerous cells and prevent skin aging before time. The presence of terpenes, caryophyllene oxide and p-selinene produces relaxation effects. Guava leaves contain many compounds which act as fungistatic and bacteriostatic agents. Guava has a high content of important antioxidants and has radio-protective ability. Quercetin is considered as most active antioxidant in the guava leaves and is responsible for its spasmolytic activity. Its ethyl acetate extract can stop the germ infection and thymus production. Guava possesses anti-viral, anti-inflammatory, anti-plaque and anti-mutagenic activities. Guava extract shows ant nociceptive activity and is also effective in liver damage inflammation and serum production. Ethanolic extract of guava can increase the sperm quality as well as quantity and can be used for the treatment of infertile males.

National status

Tripathi and Kohli (2014), studied pharmacognostical standardization and antidiabetic activity of *Syzygium cumini* (Linn.) barks on streptozotocin-induced diabetic rats.*Syzygium cumini (Linn*.) is one such potential folklore medicinal plant of Indian origin, belonging to the family Myrtaceae.It is widely used in Ayurveda and other Indian folk medicine for the treatment of various diseases in particular diabetes.

Bipul Biswas (2013), studied the antimicrobial activities of leaf extracts of Guava (*Psidium guajava* L.) on two Gram-Negative and Gram-Positive Bacteria. The determine the gram-negative bacteria (*Escherichia coli* and *Salmonella enteritidis*)

and gram-positive bacteria (*Staphylococcus aureus* and *Bacillus cereus*) were used. He force that guava leaves have potential antibacterial activity against these bacteria.

Sumitra Chanda investigated (2014) importance of pharmacognostic study of medicinal plants. Accordingly such studies are important and lays down parameters for standardization and authentication of medicinal plants with the help of which adulteration and substitution can be prevented. All the parameters can be evaluated in pharmacognostic study such as organoleptic characters, macroscopic study, microscopic study, powder study, physico chemical analysis (moisture content, loss on drying, ash values, extractive values), phytochemical analysis, fluorescence analysis along with their importance.

P. guajava is a well-known traditional medicinal plant used in various indigenous systems of medicine. It is widely distributed throughout India. The pharmacogonstical study provides physicochemical and phytochemical details of the leaves of the *P. guajava* which are useful in laying down standardization and pharmacopoeial parameters Mital et.al (2015).

Snehalatha & Rasmi (2014) has made a study on phytochemical evaluation and pharmacognostic standardization of *Syzygium palghatense* endemic to Western Ghats. Accordingly the plants belonging to the genus *Syzygium* has received much attention since ancient times due to its multidimensional uses for mankind. These plants in general, reported to contain a wide array of phytomolecules with a broad spectrum of biological activities that include antihypoglycemic, antioxidant, anti-inflammatory, anticarcinogenic, and antihypertensive properties.

Significance of the study:

Plants have been used for medicinal purposes long before prehistoric period. Treatment with medicinal plants is considered very safe as there is no or minimal side effects. These remedies are in sync with nature, which is the biggest advantage. The golden fact is that, use of herbal treatments is independent of any age groups and the sexes. Human beings are depending on botanicals directly or indirectly for the treatment of various ailments since ancient time, according to the World Health Organization, reports nearly 80% psychological and physical health mainly because of the two reasons one is they cannot afford the products of Western pharmaceutical

industries and the second reason is due to side effects of the synthetic drugs followed by lack of healthcare facilities. India has a rich culture of medicinal herbs and spices, with high potential abilities for Ayurvedic, Unani, Siddha traditional medicines but only very few have been investigated chemically and pharmacologically for their potential medicinal value. Rural masses of many developing countries still rely on traditional medicine for their primary health care needs and have found a place in day-to-day life. These medicines are relatively safer and cheaper than synthetic or modern medicine. Activity guided studies on the selected plants will be very much useful in designing integrated therapy against diabetes and cancer.

Proposed Work plane/ formulation and structure of study / year wise plan of work and target to be achieved

The current research work planned for three years as follows.

First year:

1. Literature Survey/Review of Literature.
2. Ethnobotanical survey, collection and identification of plants including Pharmacognostic study.
3. Extraction of plant materials.

Second year:

1. Phytochemical analysis of selected plants.
2. HPTLC analysis of plant extracts
3. Antioxidant and antimicrobial activity of selected plants.

Third year:

1. Anti-diabetic activity of selected plant extract.
2. Anticancer activity of selected plants.
3. Data analysis and thesis writing for submission to the University.

Presentation of the research work by attending conference workshops will be done alongside all the activities as per mentioned above.

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Mr. R. N. More
(Research Scholar)

Dr. D. M. Jadhav
Research Guide
Science College Nanded